International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-3S, February 2019

Heuristic Approach for Dynamic Path Localization for Fault Localization in IP Based WDM Networks

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Abstract: ***Today's Internet Service Provider (ISP) backbone networks offer enhanced performance to overcome loss, delay, and unavailability. However, in the event of a problem in a network component, the network experiences failures in terms of link faults, path faults, and router crashes. An efficient automated fault localization methodology is necessary to identify faults in the network. The challenges involved in ISP backbone networks include identifying the precise location of the fault and rectifying it immediately. These are, however, time-consuming and create added problems, apart from increasing operational expenditure. There must be a focus on improving device reliability to reduce the time and operational expenditure involved. Hence, fault localization play key roles in locating the fault and rectifying it immediately to avert network disruptions and related problems. Cross layer approach between IP layer (higher layer) and optical layer (lower layer) is adopted. Moreover, Fault occurrences in IP networks are normally brought on by the failure of components such as routers, links, and paths. Also, a shared component failure is identified as one that relies upon other components and culminates in a number of faults. Since hundreds of components are involved in this process, it is difficult to identify a fault and rectify it immediately. The shared component failure and the exact root cause of the failure of the component in the lower layer network need to be identified***

Keywords: virtual topology, localized on demand routing, risk model, reconfiguration.

I. INTRODUCTION

The complexity of the problem increases when the application is executed on a Heterogeneous Distributed System (HDS), as both the computational nodes and the underlying networks connecting them are heterogeneous. Hence the greedy approximation approach optimally resolves this problem Optical systems are reconfigured, which adjusts dependent on the circumstance and request. Reconfiguration systems of optical systems for static and characterized traffic are being done from years back. Here the issue of optical system reconfiguration for changing traffic is considered and diverse strategies are inspected which are at present being used. We consider, the traffic variation, i.e., maximum link load has the primary target work. Wavelength progression confinement could likewise be considered. The consequences of reconfiguration and recovery on a basic four-node network are considered. The estimations of congestions and normal weighted number of hops for differing level of traffic are given. Each wavelength transmits different kind of data, so different constraint need to be considered, Therefore optical networks are reconfigured in order to adopt according to the situation and demand. Automated fault localization based on risk modeling can be used to identify faults at IP (higher) layers and map them to the (lower) optical layer so as to establish the exact root cause of the failure. So an efficient risk model need to be devised for IP based WDM network. Reconfiguration of optical system helps in lessening congestion and improves the productivity of the system. Quality of service can be taken in to consideration amid reconfiguration. It additionally incorporates virtual topology planned for all intents and purposes and reconfiguration utilizing genetic algorithm.

Manuscript published on 28 February 2019.
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II. EXISTING SYSTEM

Service disruptions and unanticipated alarms in cross networking layers are not accurately detected by current fault localization methodologies. Operators are able to locate faults at higher layers but fall short of establishing the actual root cause of the failure. Reconfiguration of optical networks helps in reducing congestion and improves efficiency of network

III. PROPOSED SYSTEM

Heuristic calculation is proposed for reconfiguration of virtual topology, because of fluctuating traffic in the system, it ends up important to arrange or evacuate existing light ways. A greedy heuristics approach helps determine the causes underlying failures in lower layers. Such an approach uses a minimum time span and efficiently translates high-level failure notifications into lower-layer root causes in three specific scenarios in a tier-1 ISP using risk modeling. Handle fault localization in the cross-layer network and deal with difficulties brought on by rapid technological changes

IV. FAULT LOCALIZATION

Failures are detected and evaluated at the higher layers using various performance metrics. These failures are correlated, according to the risk model, to identify their exact root cause. One of the challenges associated with this problem is to devise efficient fault localization and fault management capabilities that are in line with current trends in internet backbone networks. Fault localization that identifies the exact root cause of the failure in the cross-layer network is the principal objective here. Moreover, some of the new technology incorporated into cross-layer networking raises the potential for unanticipated interactions and service disruptions. These may not be detected by the built-in monitoring capabilities of the individual layers comprising the whole. Automated fault localization based on risk modeling can be used to identify faults at IP (higher) layers and map them to the (lower) optical layer so as to establish the exact root cause of the failure.

V. FAULT MANAGEMENT

Fault management implemented using the existing algorithm, does not provide effective results in handling the looping of error messages and packet dropping in case of route convergence and the cost of the link is based on the labeled cost. Fault management techniques ensure the forwarding continuity of data packets by computing the cost of the link using the shared bandwidth, delay, and number of hops. So an efficient fault management implementation is vital to handle multiple link failures Virtual Reconfiguration need to be done when any of the components fails, between nodes and routers in the IP network, and to minimize the traffic and transmit the data without further delay

VI. RELATED WORK

Methodologies for fault localization are to be composed of segments characterized by different computational requirements, including cross-layer fault detection, a minimum time span, improved Quality of Service (QOS) parameters, accuracy, precision, and reliability (Crochatet al. 2000). Heterogeneous systems that incorporate active diagnosis risk modeling, and designed to handle different types of faults, are most appropriate for applications such as these.A key factor in achieving the best performance possible from cross-layer environments is to determine the precise location of the fault and identify shared failure components.This problem has to do with faultidentification, diagnosis, and alleviation.(Rai et al. 2005).

In network management, fault management is crucial in rectifying abnormal components or malfunctioning ones without culminating in networkdegradation or disruption (Carmen Mas & Patrick Thiran 2000). While much fault management implementation effectively handles single link failures, error message looping and packet dropping are the end result in the case of multiple link failures.Hencefault management implementation that can handle multiple link failures without error message looping and packet dropping must be devised (Glenn Robertson et al. 2012).

An automated fault diagnosis system that uses hierarchical reasoning and alarm correlation is another approach to fault localization (Chao et al. 2001). This hierarchical domain-oriented reasoning mechanism is best suited to the delegated management architecture. It is based on the causality graph of the sensibly-reduced network fault propagation model from the result of the empirical study. An automated fault diagnosis system called the Alarm Correlation (AC) view that isolates network faults in a multidomain environment is considered, in line with the hierarchical reasoning mechanism.The AC view helps identify a component's abnormal behavior but does not specify the exact root causes (Jinsik Kim et al. 2008). This AC view identifiesfailures occurring only in higher layers.

VII. IMPLEMENTATION CONSTRAINTS

Implementation constraints

Physical layer is planned by considering elements, for example, the general traffic dissemination, the connection's expense, and the area of the network. Virtual topologies are intended to help the physical topology. In this way, the physical topology should be planned with some traffic. In light of this virtual topology is reconfigured. The limitations forced on the physical layer while structuring the virtual layer are recognized. The physical and virtual topology in a system, are structured freely.

VIII. SYSTEM FEATURES

It has been proposed for a structure which consequently creates a virtual topology for the given physical topology considering the IP address for the system gadgets (hubs, switches, switches) as their base for the reconfiguration methodology.

IX. PERFORMANCE MEASURES

Performance metrics used that improves the accuracy and precision of the FAULT localization and fault management are:

Average packet transmission (%), measured as the number of packets transmitted in a certain time period from source to destination.

Average throughput (Mbps), measured as the maximum data transmitted in bits per second of a link.

End-to-end delay (milliseconds), calculated on the basis of the average time taken by a data packet to arrive at the destination. Delays caused by the route discovery process and queues in data packet transmission are included.Only data packets successfully delivered to their destinations are counted.

Failure signatures for the three failure scenarios involving routers, links, and paths are evaluated based on the performance metrics above.

X. CONCLUSION

Applying fault localization with risk modeling for optical networks to compute paths dynamically so as to contrive a more accurate risk model. Considering more failure scenarios to capture many more high-level failure signatures.

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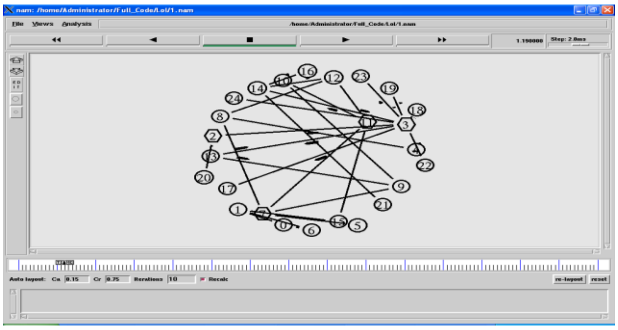
Designing a fault management technique to handle route convergence with reduced overhead. Ensuring loopfree routing and convergence in case of multiple component failures.

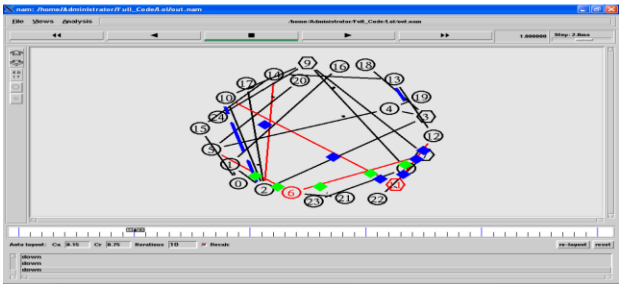
I. FUTURE WORK

Future work could incorporate building up a reconfiguration calculation for dynamic traffic issue. Nature of administration can be taken in to thought amid reconfiguration. It additionally incorporates virtual topology structure and reconfiguration utilizing hereditary calculation helps in accurate fault localization and fault mamagement.

XI. RESULTS



Simulated IP network topology with packet transmission



Failure of routers, nodes and link degradation

Results of the evaluation of the average packet transmission for router failure

Threshold	Router	Group of Routers	Link
1	100	70	20
2	97.3623031	67.54425076	17.9798888
3	95.1217308	65.0050352	15.5762589
4	92.1217308	63.67901861	12.8456118
5	90.5596252	60.43570682	10.4397191

Results of the evaluation of the average throughput due to link faults

Threshold	Link	Router	Node
1	100	60	20
2	96	58	18
3	98	56	16
4	96	54	15
5	94	52	12

Results of the evaluation of the end-to-end delay due to path faults

Threshold	Path	Link	Node
1	30	20	10
5	35	23	12
10	38	25	14
15	40	25	15

20	42	28	18
25	45	30	21
30	46	31	24

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